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Shahparnia

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(54) INPUT DEVICE FOR AND METHOD OF COMMUNICATION WITH CAPACITIVE DEVICES THROUGH FREQUENCY VARIATION

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(52) U.S. Cl.

(58) Field of Classification Search

None

See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

3,462,692 A	8/1969	Bartlett
3,970,846 A	7/1976	Schofield et al.
4,220,815 A	9/1980	Gibson et al.
4,281,407 A	7/1981	Tosima

4,289,927 A 9/1981 Rodgers 4,320,292 A 3/1982 Oikawa et al. 4,334,219 A 6/1982 Paülus et al. 4,345,248 A 8/1982 Togashi et al. 4,405,921 A 9/1983 Mukaiyama (Continued)

FOREIGN PATENT DOCUMENTS

CN	1243282 A	2/2000
CN	1278348 A	12/2000
	(Cont	inued)

OTHER PUBLICATIONS

Haines, L. (Mar. 23, 2005). "Japanese Enable Human Area Network," *The Register* located at http://www.theregister.co.uk/2005/03/23/human_area_network/print.html>, last visited Jun. 30, 2009, two pages.

(Continued)

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(57) ABSTRACT

A computing device configured to receive data from a peripheral device, such as a stylus. The computing device includes a processor, a touch interface, such as a touch screen, in communication with the processor and configured to detect an input corresponding to an object approaching or contacting a surface. The computing device further includes a touch filter in communication with the touch interface and a peripheral filter in communication with the touch interface. The touch filter is configured to reject a peripheral frequency corresponding to a peripheral signal of the peripheral device and the peripheral filter is configured to reject a touch frequency component corresponding to a touch signal corresponding to a touch input.

15 Claims, 9 Drawing Sheets

